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ABSTRACT

This booklet, one of a series developed by the Frederick County Board of Education, Frederick, Maryland, provides an instruction module for an individualized or flexible approach to 7th, 8th, and 9th grade science teaching. Subjects and activities in this series of booklets are designed to supplement a basic curriculum or to form a total curriculum, and relate to practical process oriented science instruction rather than theory or module building. Included in each booklet is a student section with an introduction, performance objectives, and science activities which can be performed individually or as a class, and a teacher section containing notes on the science activities, resource lists, and references. This booklet introduces students to the geological features of shorelines and the investigation of the interaction between water and land occurring at shorelines. The estimated time for completing the activities in this module is 2-3 weeks. (SL)

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AIDS TO INDIVIDUALIZE THE TEACHING OF SCIENCE

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MINI-COURSE UNITS

BOARD OF EDUCATION OF FREDERICK COUNTY

1973

SE 018 648

Frederick County Board of Education

Mini Courses for

Life, Earth, and Physical Sciences

Grades 7, 8, and 9

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Frederick, Maryland

1973

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FOREWORD

The contents represented in these modules of instruction, called mini courses, is an indication of our sincere desire to provide a more individualized and flexible approach to the teaching of science.

Data was accumulated during the school year relative to topics in life, earth, and physical science that were felt to be of greatest benefit to students. The final selection of topics for the development of these courses during the workshop was made from this information.

It is my hope that these short courses will be a vital aid in providing a more interesting and relevant science program for all middle and junior high school students.

Dr. Alfred Thackston, Jr.
Assistant Superintendent for Instruction

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COASTLINE DEVELOPMENT

Prepared by

Nelson S. Ford

CONTENTS

Student Section (white pages)

- Introduction
- Objectives
- Activities
  - Worksheet #1
  - Worksheet #2
  - Identification of Coastal Landscapes
  - Worksheet #3
  - Worksheet #4
- Evaluation

Teacher Section (blue pages)

Estimated Teaching Time

2-3 weeks

COASTLINE DEVELOPMENT

INTRODUCTION:

Shorelines are constantly changing with material either being deposited or eroded away. Since many people, including some of you, enjoy visiting our beaches and shorelines, knowing something of the features you see would certainly be worthwhile.

OBJECTIVES:

The student will be able to:

1. describe two major types of coastlines based on the way they were formed.
2. list several geological features associated with shorelines.
3. describe the development of a coastline from youth to maturity.
4. identify coastal landscape features as shown on a model or drawing.
5. identify the parts of a wave.

ACTIVITIES:

A. Waves

1. Put together a wave tank or stream table of your own, complete with private beach! It's easy enough - any large shallow pan or basin will do. See Worksheet #1 for further information. Be sure to answer all the questions so that you get credit for the work.

2. Read! Either one or the other.

   a. The World We Live In, 1965, pp. 260-262. Answer questions on that on page 275, numbers 1, 2, 3, 4, 5.

   b. Modern Earth Science, 1965, pp. 507-510. Questions - pp. 521-522.
      Group A - 1, 2, 3, 4, 12 (T-F)
      Group B - 1, 7 (Write out)

3. Take a look at the filmstrip, Currents, Waves and Tides. It'll help clear up any questions you have.

B. Beaches

1. Don't throw your wave tank away just yet! You'll need it here, too. First try Worksheet #2 in this packet and answer the questions. Let's see what kind of scientists you really are!

2. Extra credit assignment for those of you who really flash along - try investigation 9.2 in IET. See your teacher for a copy of the book (any edition will do).

3. Look at the super 8 film loop called Types of Shorelines. Should be right up your dohickey!

4. Don't miss the flick, The Beach - A River of Sand. It's a truly great film in living color.

5. This part should be a breeze for students as good as you.

   a. The World We Live In, 1965, pp. 264-269. Answer questions on p. 275, numbers 1, 4, 5, 9, 10.

   b. Modern Earth Science, 1965, pp. 374-377. Questions on pp. 384-385.
      Group A - 6, 8, 2, 5
      Group B - 5, 6

6. If available, identify the numbered features on a 3-D coastline model #1, Coastline of Submergence, features 1-20 except for #13, 8, 15 and 20.

   If not available, then do the worksheet in this packet called Identification of Coastal Landscapes (#7A). You'll be able to get some of the answers for that from the transparency titled Coastal Landscapes (#7).

C. Shoreline Development

1. Read through Worksheet #3 and answer any questions that are there. Don't skip around or you're liable to miss something important.

2. Look up the following topics and write a short one page report on any one:

   a. coral atolls

   b. tsunamis

   c. ocean waves

3. Topographic maps are interesting and fun to work with. Get ahold of the Point Reyes Quadrangle sheet and do the questions on Worksheet #4 in this packet.

4. Read either one and answer the questions.

   a. The World We Live In, 1965, pp. 269-272. Questions on p. 275, #20, 21, 25, 26.

   b. Modern Earth Science, 1965, pp. 379-383. Questions on pp. 384-385.
      Group A - 8, 9, 11, 12
      Group B - 10, 11

All done? Good! Make sure your name is on everything and turn it in. Check with your teacher now for a copy of the quiz that goes with this.

WORKSHEET #1

Instructions to pupil: Do not write on this paper unless told to do so. Answer all questions as completely as you can. Good luck!

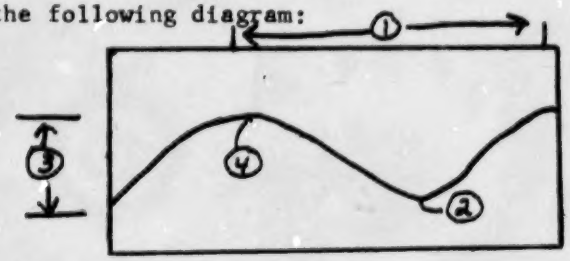
A. Waves

Wave motion can be studied by using a wave tank or stream table with fine sand spread evenly throughout to a depth of about 3 centimeters. Place a sloping sand surface at the far end of the tank and add water until it is about halfway up the beach. Waves can either be made by hand or better yet, by using a fan. Try making waves both at the end of the tray and also diagonally across it.

1. Look up and define the following words using any earth science books you have in your classroom.

   a. crest
   b. trough
   c. wave length
   d. wave height
   e. frequency

2. Label the following diagram:



3. Try to estimate the frequency of the waves by counting the number of crests or troughs going by a point in a minute.

4. Use a centimeter scale to estimate both wave length and wave height.

5. Where are the waves the highest - close to the fan or far away?

6. Drop a crystal of potassium permanganate in the deep water along with a small chip of wood on the surface to observe the movement of the water. Does the dye and the wood chip move in toward shore?

7. Draw a sketch of the dye looking in from the side after several minutes have gone by.

8. List a couple causes of waves (do not forget tsunamis!). Circle the one that you consider to be the main cause of waves.

9. Long rolling ocean waves are called swells - what causes them?

A. Beaches

Try piling the sand up steeply at the end of the wave tank instead of a more gentle slope.

1. Do you have any breakers on your sandy beach? (Keep the fan going, of course!)

2. Which gives better breaking waves - a gentle slope or a steep slope?

3. Do you see any sand being washed away on your beach? If you are careful, a small cliff will eventually form. Lower the water level by about two or three centimeters and continue making waves until there is no more change. (Note to teacher: More information is available in IET 9.1 and 9.2. Both investigations are informative and worthwhile.)

4. Look up and define the following words:

a. spit	d. bay mouth bar
b. look	e. barrier island
c. tombolo	f. lagoon

5. A coastline is constantly changing with larger rocks being ground down into smaller rocks and eventually into sand. Sand can then be easily moved by the forces of wind, waves, and currents. Label the features in the following diagram. Use question #4 if you need help.

6. Look up and define rip current, undertow and longshore current.

7. See if you can create any of the above features by placing the fan at different places around the wave tank. Results?

Now you're done with the wave tank! Clean up everything before you go on.

Name _____ Date _____

IDENTIFICATION OF COASTAL LANDSCAPES

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1. Identify the coastal landscape features lettered on the above map.

A. _____ F. _____

B. _____ G. _____

C. _____ H. _____

D. _____ I. _____

E. _____ J. _____

2. Is this an example of an emergent or submergent coast? _____

3. What are your reasons for thinking so? _____

_____

_____

4. Propose a hypothesis that would account for the formation of coastal landscape feature "E". _____

_____

_____

5. What do you think will happen to coastal features I, G and B in the near future? _____

_____

6. In what direction is the longshore current moving? _____

7. What effect does this current have on the bar? _____

_____

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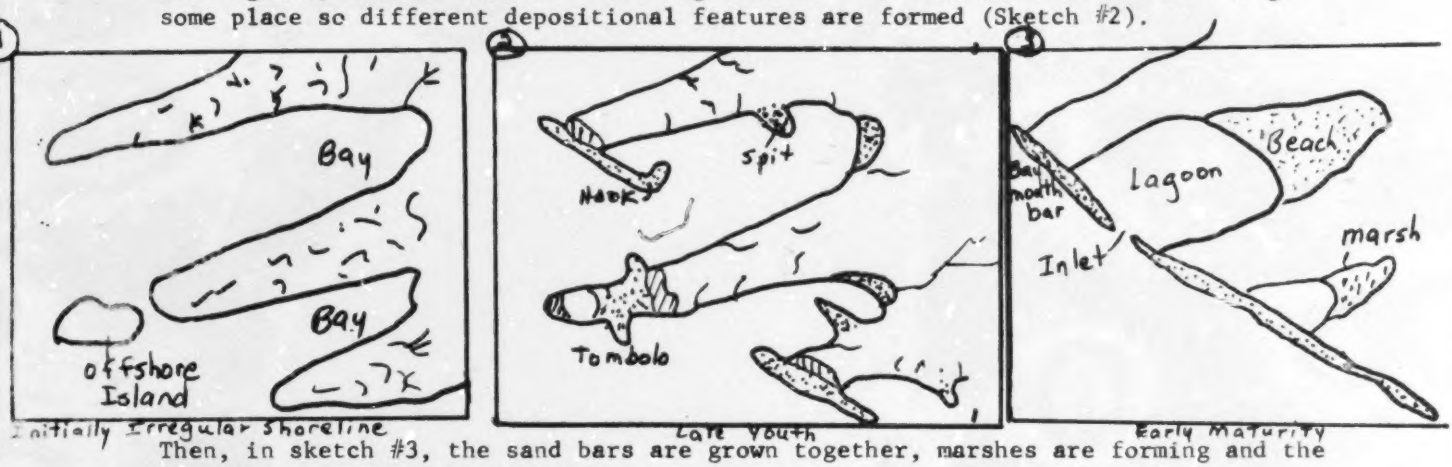
A. Coastline Development

Instructions to pupils: Read this section and then answer the questions.

No matter how jagged a coastline appears, eventually water will grind down the headlands and fill in the bays or build sand bars across them. Look at the following sketches. The first shows a fairly youthful (young) shoreline - how did it get to be young? Anyhow, waves cut away at the headlands (there's that word again!) and cut into them forming cliffs. The sand that results has to go some place so different depositional features are formed (Sketch #2).



Then, in sketch #3, the sand bars are grown together, marshes are forming and the coastline is no longer jagged.

Most coastlines do not stay smooth for a very long time, however, because the land is either rising or dropping. For example, the New England area of the United States has been steadily dropping for quite a while so that coastline is called a submergent coast. Fiords are an indication of this type of coast. The whole Chesapeake Bay area is really just a drowned river valley or estuary.

A coastline formed by the dropping of sea level or by the rising of the land is called emergent. Good examples? Well, most of the western coast of both North and South America is slowly rising as is shown by the presence of wave-cut benches and sea cliffs.

Sea level has also been rising world-wide since about 1890. Currently the rate of rise is about one foot per century. If all the glaciers in the world melted, the sea would rise as much as 300 feet.

1. Look up and define

   a. head lands
   b. fiord
   c. estuary
   d. wave-cut benches
   e. sea cave

2. Would Frederick be above water if all the glaciers in the world melted? (Check a Frederick County topographic map.)

3. What might be a cause of the current rise in sea level?

4. At the present rate of sea level rise, how long will it be before all the ice is melted?

5. Name four major cities in the United States that will be in danger if this rise in sea level continues.

6. What is the difference between a submergent and emergent coast?

Point Reyes, California

1. Notice first of all where this map section or quadrangle is located on the map of California. Would you say it is north, east, central or where in the state? (Look around!)

2. On the regular part of the map find Tomales Bay (NW part of map). This long narrow bay is the northernmost end of a famous earthquake zone called what? The southern side of Tomales Bay is slowly moving toward the NW taking with it much of the western part of California.

3. Find the following features on the map and then identify them by name or by giving their location.

   a. tidal marsh
   b. bay-mouth bar
   c. spit
   e. estuary
   e. delta
   f. look
   g. lagoon

4. What is the contour interval?

5. What is the most recent date on the map?

6. What is the scale of the map?

7. What does that (#6) mean to you?

8. What is the distance in miles from Mt. Wittenberg (East-Central) directly across to the Coast Guard Lighthouse at Point Reyes (SW)?

9. What does the green color on the south side of Tomales Bay all along Inverness Ridge represent?

10. Can you find a quarry on the map? Draw the symbol for quarry.

EVALUATION

Fill in.

1. Sediment deposited across the mouth of a bay form a _____ bar.
2. A bar with one end attached to the land is called a _____.
3. When the land along a coast sinks, a _____ shoreline is formed.
4. The curved end of an offshore bar is called a _____.
5. Breakers indicate _____ water.
6. An example of a shoreline of emergence is the coast of _____.

Underline the correct response.

7. Drowned bay are caused by (the rising of the land, the sinking of the land, shore currents).
8. Fiords are found along the coast of (England, Norway, Gulf Coast).
9. A beach is formed by the action of (waves, wind, rivers).

True-False

10. The presence of marine fossils is evidence that a shoreline has been rised.
11. A lagoon eventually becomes filled in and forms a tidal marsh.
12. An estuary is formed by the rising of the land.
13. An irregular shoreline is likely to have good harbors.

Short answer.

14. What is the difference between a longshore current, a rip current, and undertow?
15. Describe the development of a coastline from early youth to maturity.

1. Check with your own library or the IMC for filmstrips, movies, transparencies, etc., used in this unit.

   a. L 551.4 (super) - Types of Shorelines

   b. F 553 - The Beach, A River of Sand

   c. Milliken series, The Changing Earth, 1972

   d. FS Currents, Waves and Tides (TJ Library)

   e. FS Work of the Sea (TJ Library)

   Having various topographic maps of coastal areas available in the room for the students to use would be helpful. A partial list of useful maps follows:

   a. Boothbay, Maine

   b. Tom's River, New Jersey

   c. Hull and Nantasket, Massachusetts

   d. Oceanside, California

   e. Point Reyes, California

3. Ward's Natural Science Establishment Geomorphological Model set has eight plastic models, one of which shows coastal features by number. These can be identified by the student.

4. Use as large a basin as possible for the wave tank. Encourage experimentation by the students. Potassium permanganate crystals are probably available from your high school chemistry lab.

5. If available, you may be interested in having students do the following:

   a. ISCS, 1972, Crusty Problems 3, Chapter 4, pp. 152-195

6. An evaluation page is attached which can be used if desired.

Evaluation Form for Teachers

1. Name of the mini course _____

2. Was this unit appropriate to the level of your students?

3. Explain how this mini course was used with your students. (Individual, small group, or total class)

4. Identify the plus factors for this course.

5. List the changes that you would recommend for improvement.

7. Did you use any other valuable resources in teaching this unit? If so, please list.

PLEASE RETURN TO SCIENCE SUPERVISOR'S OFFICE AS SOON AS YOU COMPLETE THE COURSE.

ADDITIONAL SCIENCE MINI-COURSES

LIFE SCIENCE	Prepared by
A Study for the Birds	Terrence Best
Creepy Critters (Snakes)	Terrence Best
How's Your Plumbing?	Paul Cook
Guess Who's Been Here for Dinner	Paul Cook
Plants - The "Other" Living Things	Sharon Sheffield
Let's Look at You - The Human Organism	Sharon Sheffield
Classification: Why is There a Need?	Melvin Whitfield
Protist: The "Unseen" Kingdom	Melvin Whitfield

EARTH SCIENCE	
Coastline Development	Nelson Ford
Ocean Currents	John Fradiska
Features of the Ocean Floor (Ocean Floor Topography)	John Fradiska
Space and Its Problems	John Geist
Invertebrate Fossils: Clues to the Distant Past	John Geist
An Attempt towards Independent Study in Astronomy	John Geist

PHYSICAL SCIENCE	
Household Chemistry	Ross Foltz
Notions on Motions	Kenneth Howard
Environmental Chemistry	Fred Meyers